



Scottish & Southern
Electricity Networks

North of Scotland Energy Efficiency and Heat

December 2017



Introduction

Energy efficiency and heat have become integral parts of energy policy, with initiatives being created by the UK and Scottish Governments to reduce energy consumption and decarbonise heat. This paper will cover energy efficiency of electricity and heat. Decarbonisation of heat is expected to result from both energy efficiency improvements and the switching of heating fuels to alternative lower carbon solutions.

As the network owner in the north of Scotland, Scottish and Southern Electricity Networks (SSEN), we are interested in understanding the impact that developments in energy efficiency and heat may have on the network.

Having undertaken initial research into energy efficiency and heat, we are now seeking views on a number of identified issues that we believe may impact the development of energy efficiency and heat in our area. Your responses will be used as an input into our planning process to determine the future requirements of the network in the north of Scotland.



About us

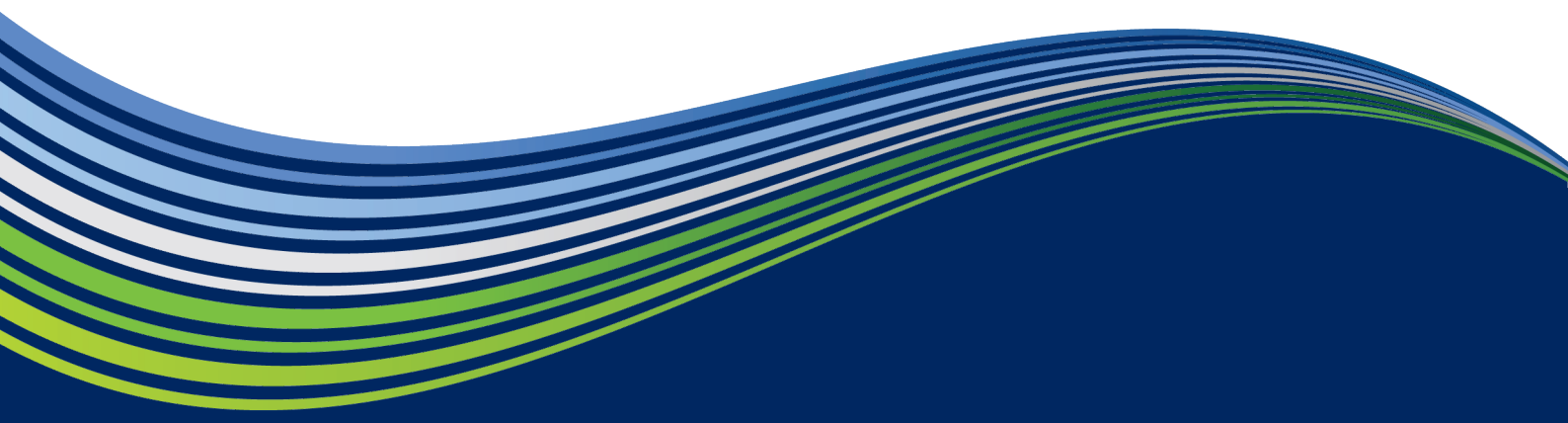
We are part of Scottish and Southern Electricity Networks, operating as Scottish Hydro Electric Transmission plc under licence and are responsible for maintaining and investing in the electricity transmission network in the north of Scotland.



Scottish & Southern
Electricity Networks

Scottish
Hydro Electric
Transmission plc

Scottish Hydro
Electric Power
Distribution plc



Engagement process

Our initial research identified 3 groups, shown in Figure 1, with significant influence on the development of energy efficiency and heat at a local level. We engaged with Governments and local authorities as they are at the forefront of designing and implementing policies. We also spoke with other Network Operators to find out how they take the changing external environment into consideration when designing their networks. Finally, we involved Community Energy Groups to provide a voice for customers.

We met directly with the groups identified in Figure 1, carrying out targeted interviews to identify issues affecting them. The second stage of our engagement is this broader consultation where we are seeking views from a wider group of stakeholders and customers.

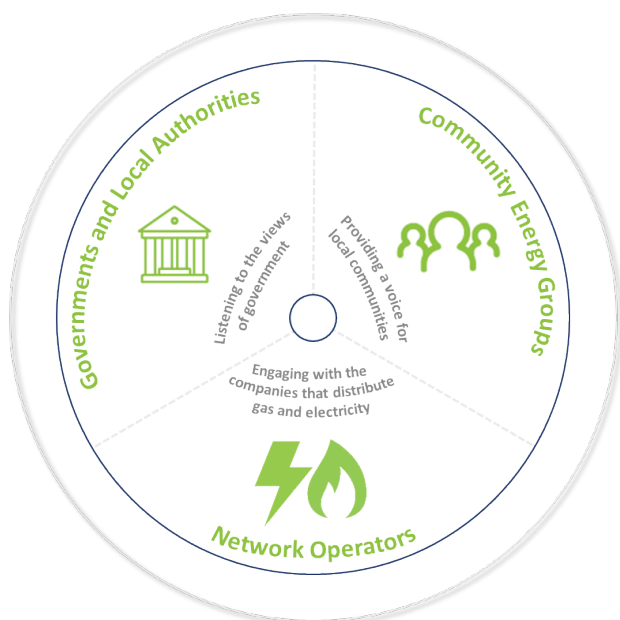
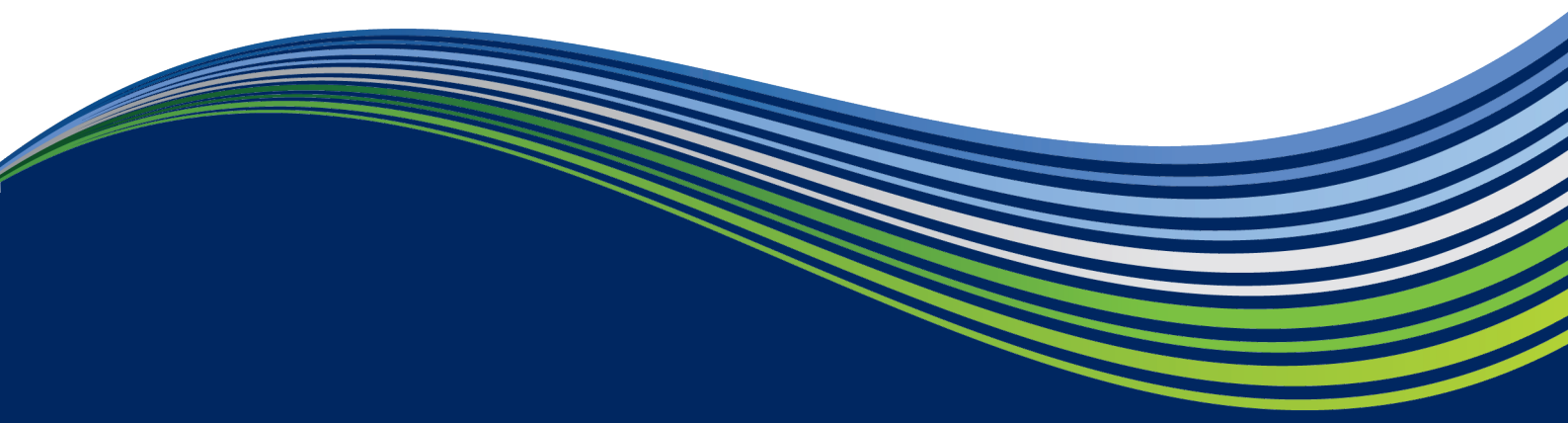


Figure 1: Key groups identified

Groups	Organisations
Governments and Local Authorities	UK Government Scottish Government Highland Council Aberdeenshire Council Perth & Kinross Council
Community Energy Groups	Local Energy Scotland
Network Operators	SGN SHEPD



Our research and your feedback

We undertook research into energy efficiency and heat using a variety of publicly available sources and received responses from those we engaged through our face-to-face meetings. A summary of our research and the feedback we received, grouped by theme, is noted below:

Energy Efficiency

The Scottish Government set an energy efficiency target to reduce total final energy consumption by 12% by 2020¹ which was achieved in 2014, earlier than expected.

Our initial analysis carried out in August 2017 identified that gas and electricity consumption by residential customers has been declining since 2005 in line with trends seen at a GB level². An average Scottish domestic consumer now consumes nearly a third less gas than a decade ago. This reduction is mainly due to energy efficiency improvements, rising gas prices and underlying economic conditions.

Similar consumption trends apply to electricity where we can see an average decrease of 12% in its usage explained by factors such as weather conditions, energy efficiency improvements, increased prices, the recession, changes in building stock and household composition².

As the consumption of electricity for buildings and industry constitutes 22% of Scotland's energy use¹, reducing consumption through improving energy efficiency is an integral part of governmental policy.

Expectations for the future of Energy Efficiency

In October 2014, the European Council set an indicative target at an EU level of at least a 27% improvement in energy efficiency in 2030 which will be reviewed by 2020. However, considering reductions achieved to date, there is only limited potential remaining to capture further efficiencies.

We have seen increasing levels of energy efficiency that have been achieved through improvements made to appliances. 75% of cold appliances are now rated A or above while this percentage increases to 90% for wet appliances. Research by Defra, DECC, and the Energy Savings Trust (EST) found that households, in England, owned an average of 41 appliances, having grown from around 12 per household in the 1970s. Improvements in the energy efficiency of appliances has kept demand down but in the future, as more and more appliances are purchased, there is the potential that we could see a return to growth of residential demand.

In Scotland, heat constitutes 53% of all energy consumption³. Achieving a reduction in this area is partially dependent upon reducing how much heat we use in our buildings and by the type of building stock in Scotland.

Scotland has an ambition to decarbonise its heat sector and is aiming for a 98% emissions reduction for non-domestic buildings and 75% emissions reduction for domestic buildings by 2032 through

¹The Scottish Energy Strategy: The future energy in Scotland. Scottish Government. January 2017.

²Sub-national electricity and gas consumption statistics. Department for Business, Energy and Industrial Strategy. December 2016.

³The Scottish Energy Strategy: The future energy in Scotland. Scottish Government. January 2017.



fulfilment of the Climate Change Plan. To achieve this reduction, the Scottish Government introduced new energy efficiency Building Standards in 2010 and invested in home efficiency programmes. Key areas which contributed to improvements in energy efficiency were; increases in wall insulation dwellings by 9% (from 62% to 71%) between 2010 and 2015 and increases in the percentage of houses with high standard loft insulation to 32% in 2015⁴.

The UK Government also introduced Energy Company Obligations (ECO) scheme. Through the introduction of ECO, nearly half a million new, efficient boilers have been fitted across the UK. The success of this programme was such that by 2007 almost all replacement boilers being installed were 90% efficient.

Building stock was mentioned as being a factor which would impact energy efficiency. The feedback we received informed us that in 2015 just over 42% of buildings in Scotland already had an EPC band C or above rating which constitutes an increase of 74% since 2010. Proportionately, Scotland now has 40% more homes with a good EPC rating (C or above) than England⁴. Further improvements may be difficult to achieve due to the stone structure of the remaining buildings.

According to the feedback we received from those we engaged with, further efficiency improvements likely to be achieved in the north of Scotland could range between 10 and 20%.

Do you think a 10-20% improvement in energy efficiency is likely to be achieved in the north of Scotland? If not, what would be a more appropriate range or figure?

Heat

As the efficiency of boilers has improved, further decarbonisation of heat is expected to require a shift to lower carbon fuels.

The Scottish Government has designated energy efficiency as a National Infrastructure priority, local authorities receive funding to pilot new innovative approaches to improve energy efficiency and decarbonise heat. Scotland's Energy Efficiency Programme (SEEP) was created with the goal to reduce energy demand, tackle fuel poverty, help businesses improve energy productivity and competitiveness and release savings into the public sector. The programme is expected to last 15-20 years starting from 2017/18 and the Scottish Government committed £500m to support the initiative. Local authorities and community groups advised that they have been piloting various heating solutions as part of the SEEP pilots being carried out across local authorities in Scotland. Among the technologies being considered were fuel cells, firstly running off reformed natural gas with the intention that hydrogen will be used in the future.

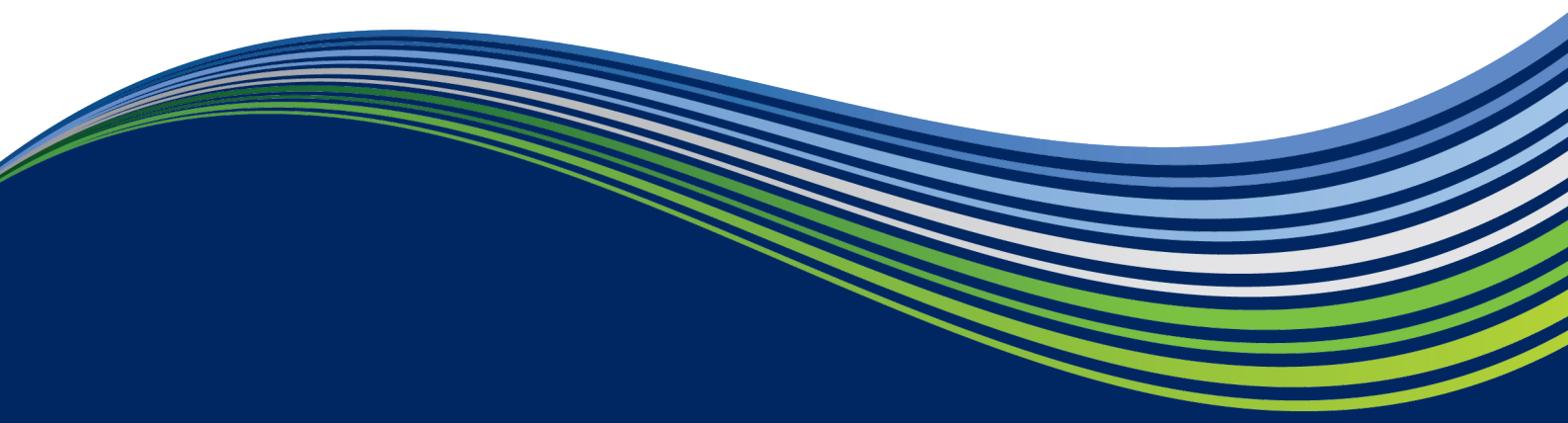
What are the most preferable approaches being considered to improve energy efficiency through the SEEP pilots?

What technologies do you think are the key to decarbonise heat?

Across the north of Scotland, the type of heating methods used varies depending on the region and availability of fuel. According to statistics in 2015, gas was a prevalent source of heating used by 44% of residents across the north of Scotland⁵. We learned that the gas network is experiencing a rise in the number of domestic connections to the existing grid.

⁴ Infographic Summary: 2015 Scottish House Condition Survey (SHCS) Key Findings, Scottish House Condition Survey, 8 June 2017.

⁵ Scottish House Condition Survey 2005 – 2015, Scottish Government



While there is a focus on shifting to low carbon heat, consumers within our area are switching to gas due to its low cost and affordability. However, off-grid areas are unlikely to be connected without large demand customers helping to make a viable economic case.

A rise in the number of households utilising gas as their main heating fuel could have a potentially negative impact on the electricity network. This is because customers switching from electric heating to gas heating would contribute to a reduction in electricity demand in those areas. If electric heating provides a source of demand for excess renewable energy generated overnight in that area then removing this form of demand could lead to electricity constraints on our network and the need for additional reinforcements.

Household heating use across the north of Scotland, 2015

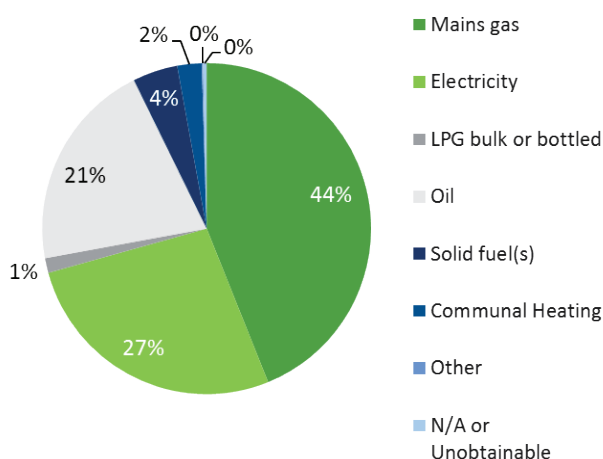


Figure 2: Source - Scottish House Condition Survey 2015

What areas in the north of Scotland are likely to see consumers switch fuel from electricity to gas?

Alternative Heating Technologies

Electrification of heat provides an alternative to the traditional gas heating model through the use of ground and air-source heat pumps. Several local authorities in the north of Scotland have outlined plans to build new housing estates in their areas and expressed interest in utilising heat pumps as a potential source of heat. On the other hand, in older properties many of which date back to the Victorian era where stone was the preferable building material, fitting heat pumps is likely to be inefficient which could impact the uptake of this technology.

What are your views on the potential for heat pumps to be used in the north of Scotland as an alternative to gas or electric storage heating and are there any further barriers limiting the uptake of this technology?

District Heating

In 2015, the Scottish Government launched its Heat Policy statement which encouraged local authorities to develop a strategic approach to district heating. The ambition was to deliver 1.5TWh of Scotland’s heat demand through district and communal heating and to have 40,000 homes connected by 2020⁶. While district heating is normally better suited to built up areas with high heat density greater than 3MW/km²⁷, the feedback we received confirmed that small district heating schemes consisting of 4-10 houses are being considered as a potential option in rural areas. Feedback suggests that all technologies are being considered such as conventional CHP, electric heating, heat pumps, thermal storage and hybrid systems.

District heating is also seen as a way to alleviate fuel poverty and the Scottish Government is looking for ways to encourage communities to begin utilising it. Whilst district heating would not be a feasible option in all areas, it is seen as particularly beneficial for isolated areas such as the far north and the Islands.

What is your preferred technology for district heat networks?

⁶ The Heat Policy Statement: Towards Decarbonising Heat: Maximising the Opportunities for Scotland, Scottish Government, June 2015.

⁷ The potential and costs of district heating networks. Department of Energy and Climate Change, Poyry, 2009.

Hydrogen

Hydrogen was mentioned by a few parties as a means to not only balance the electricity grid but also to decarbonise the gas network. The feedback we received varied and mentioned that the gas grid could currently accommodate between 10% and 20% of hydrogen content before changes to appliances would be needed.

How much hydrogen could be injected into the gas network before changes to appliances would be required?

The Scottish Government, who views hydrogen as a low cost and one of the least disruptive solutions for decarbonising heat, is also supportive to trial hydrogen/natural gas blends in the gas network with a view to fully replace natural gas with pure hydrogen in the longer term. If this option is pursued, we recognise that it could have an impact on electricity demand in the north of Scotland.

Industrial and Commercial

In contrast to the picture painted at a residential level, industrial and commercial gas consumption in the north of Scotland rose from 2005 to 2015 by 16%, faster than the 4.7% increase seen at a GB level⁸. The feedback we received suggests that this trend occurred due to increased production in the Scottish food and drink sector, agriculture industry, fishing sector and additional industrial players that support the offshore industries. Further to this, the number of enquiries relating to gaining access to the gas network has also increased from industrial and commercial companies.

What type of heating technologies are being considered by industrial and commercial companies if they are unable to gain access to the gas network?

There are different requirements for low, medium and high temperature heat depending upon the needs of the industrial process. According to a study carried out by Delta-EE⁹, sectors such as food and drink could shift towards electrification of heat due to the requirement for low temperature heat which could be provided by heat pumps. Where high temperature heat is required, it would be more difficult to use heat pumps in those processes. The research carried out by Delta-EE also highlighted that one particular process, drying, could provide substantial savings to companies if heat pumps were used in this energy intensive process.

Are heat pumps being considered as a technology that can provide heat for low temperature industrial processes?



⁸ Sub-national electricity and gas consumption statistics. Department for Business, Energy and Industrial Strategy, December 2016.

⁹ Electrification of Heat and the impact on the Scottish Electricity System, Delta Energy and Environment, 31 March 2016.

Summary

The research and feedback we received identified a number of factors and assumptions that have the potential to impact the development of energy efficiency and heat in the north of Scotland. We will use these to inform our analysis:

- Further appliance efficiency improvements may be limited and potentially offset by increased appliance ownership and number of households
 - Regional variations exist to tackling heat which will result in tailored approaches depending upon the area.
 - Significant improvements in heating efficiency have been made but further improvements likely to be limited by the type of building stock in Scotland.
- Fuel switching from electricity to gas could potentially contribute to network constraints and should be a consideration when planning expansion of the gas grid.
 - A number of alternative technologies are being considered to help achieve climate change targets, such as district heating schemes, hydrogen and heat pumps.

Are there any other areas you believe would impact the development of energy efficiency and heat in the north of Scotland?

What next?

In early 2018, we will be releasing our final consultation document on Generation & Storage and how this could evolve in the north of Scotland.

This will be followed by a paper which summaries the feedback and details the modelling undertaken to create Future Energy Scenarios for the north of Scotland.



Responding to this paper

To allow us to complete our assessment and confirm our assumptions, we would be grateful to receive your comments on the following areas:

Q1. Do you think a 10-20% improvement in energy efficiency is likely to be achieved in the north of Scotland? If not, what would be a more appropriate range or figure?

Q2. What are the most preferable approaches being considered to improve energy efficiency through the SEEP pilots?

Q3. What technologies do you think are the key to decarbonise heat?

Q4. What areas in the north of Scotland are likely to see consumers switch fuel from electricity to gas?

Q5. What are your views on the potential for heat pumps to be used in the north of Scotland as an alternative to gas or electric storage heating and are there any further barriers limiting the uptake of this technology?

Q6. What is your preferred technology for district heat networks?

Q7. How much hydrogen could be injected into the gas network before changes to appliances would be required?

Q8. What type of heating technologies are being considered by industrial and commercial companies if they are unable to gain access to the gas network?

Q9. Are heat pumps being considered as a technology that can provide heat for low temperature industrial processes?

Q10. Are there any other areas you believe would impact energy efficiency and heat in the north of Scotland?

This paper and an online feedback form can be found on our website at the following address:

www.ssen-transmission.co.uk/information-centre/industry-and-regulation/future-energy-scenarios/

If you have any other queries on the content of this paper then please get in touch with Imran Mohammed on the details below:

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We are inviting responses to this paper by **Friday 26 January 2018.**



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Information provided in response to this consultation may be used in future documents related to Future Energy Scenarios. Responses will be generalised and not attributed to specific respondents. If you would prefer the information that you provide to be treated as confidential, then please make us aware of this when responding to the consultation.

